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These substances are probably combined in the following manner. The values are expressed in grains per U. S. gallon of 231 cu. in.:

Substances.	*Grains.*	*Substances.*	*Grains.*
Sodium Chloride	3,466.921	Calcic Bicarbonate	30.537
Magnesium Chloride	347.770	Ferric Bicarbonate	1.682
Calcium Chloride	419.140	Silica	1.155
Sodium Bromide	13.711	Alumina	a trace.
Sodium Iodide	0.092	Organic matter	a trace.
Potassic Sulphate	13.771		
Calcic Sulphate	9.047	Total solids	4,303.826

It will be noticed that this water is especially rich in magnesium chloride as well as salt, and suggests ocean water in its composition, though it is of about twice the strength of the latter. The water contains also comparatively large quantities of Bromides and of Iodides, substances thus far rare in the waters of Kansas. For purposes of comparison the analyses of some celebrated waters are here inserted, with the amounts expressed in grains per gallon:

Substances.	*Artesian well, Franklin, N. Y.*	*Hathorn Spring, Saratoga.*	*Congress Spring, Saratoga.*	*Dead Sea.*
Sodium Bromide	4.655	1.534	8.559	156.53
Sodium Iodide	0.235	0.198	0.138	a trace.

The Atlantic ocean contains 31.16 grains of Sodium Bromide per gallon, and a decided trace of Iodide. The Independence water is utilized to some extent locally for bathing purposes.

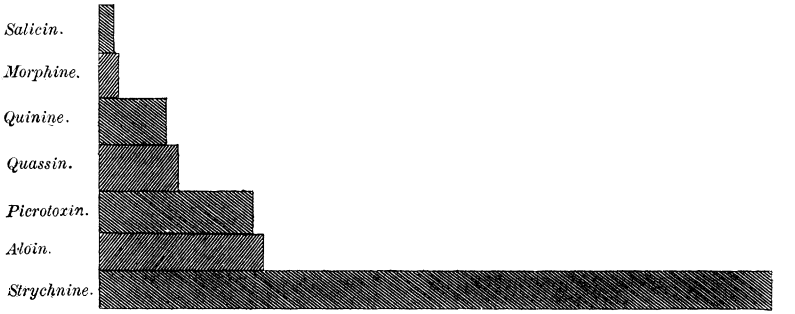
THE RELATIVE BITTERNESS OF DIFFERENT BITTER SUBSTANCES.

BY E. H. S. BAILEY AND E. C. FRANKLIN.

The method of investigation followed was similar to that reported at the last meeting of the Academy, in an article upon the "Delicacy of the Sense of Smell," and also in a paper presented to the American Association for the Advancement of Science, Phila. (1884), by one of us (Bailey), and Dr. E. L. Nichols. Briefly, the method was as follows: We made use of Salicin, Morphine, Quinine, Quassin, Picrotoxin, Aloin, and Strychnine. A series of solutions in water of each of these was prepared, such that each member was of one-half the strength of the preceding one. This series was extended till it was impossible to detect any bitter taste in the last solution. The order of the bottles containing the solution was completely disarranged, and the test consisted in an attempt to pick out, by tasting of a few drops of the contents of each bottle, those which contained a bitter substance. Some bottles containing pure water were included in the above set by way of comparison. This set of solutions was tasted by forty persons, including some of both sexes. We noted in each case how far down in the series it was possible for a person to go. The *average* amount detected is as follows:

Of Salicin it is possible to detect one part in					12,000	parts	of	water.
Morphine	"	"	"		14,000	"	"	
Quinine	"	"	"		76,000	"	"	
Quassin	"	"	"		90,000	"	"	
Picrotoxin	"	"	"		197,000	"	"	
Aloin	"	"	"		210,000	"	"	
Strychnine	"	"	"		826,000	"	"	

This relative bitterness is best illustrated by the diagram:



AVERAGE OF FORTY OBSERVATIONS.

A comparison of authorities will show that there is a wide difference of opinion as to the amount of some of these substances that can be detected by the sense of taste. Some state that one part of strychnine in 30,000 parts of water can be detected, while others place the figures at one part in 700,000. The above experiments show that the latter is nearer the truth.

Twelve of the experimenters were able to detect one part of strychnine in 1,280,000 parts of water; or if one cubic centimeter be considered as sufficient for a taste, they were able to detect $\frac{1}{1280000}$ of a grain. Several who had taken large quantities of quinine were able to detect relatively small quantities of this substance.

The fact that has been previously noticed by chemists, that solutions of aloin lose their strength on standing, was confirmed. The curious anomaly was apparent, that while some could taste solutions of aloin as dilute as those of strychnine, others could not detect any bitterness in a solution which contained one part of aloin in 1,250 parts of water. We were able to detect chemically, by concentration, the strychnine in $\frac{4}{10}$ of a cubic centimeter of a solution that contained less than one part in one million parts of water. So it would seem that a chemical test is about equal to the *average* delicacy of the sense of taste for this substance. In the case of any particular individual, however, the chemical test is liable to be more delicate. It is not necessary to say that the latter is more *reliable*, for it not only detects a bitter substance, but tells what particular principle is present. We have found that sulphuric acid and potassic bichromate gave the most delicate results. It is our intention to continue these experiments, and, by having tests made by a much larger number of persons, to more thoroughly substantiate our results.

ON THE SWEETNESS OF INVERT SUGAR, WITH SOME NOTES ON ITS PREPARATION.

BY J. T. WILLARD, MANHATTAN, KAS.

A solution of cane sugar possesses the power of rotating a ray of polarized light to the right. If this solution be treated for a few minutes with a dilute mineral acid, it is changed so that it becomes levorotary. Hence it is said to be inverted, and the product is called invert sugar. It is produced, though not so rapidly, by the action of organic acids on cane sugar. When fruit is cooked with sugar, much of the sugar is inverted. A determination of the relative sweetness of the two sugars thus assumes a practical aspect.

Invert sugar is usually said to be a mixture of equal equivalents of dextrose and